

## UNIT FOUR

# GLOBAL POSITIONING SYSTEM (GPS)

The Global Positioning System (GPS) network we all use is called Navstar and is paid for and operated by the US Department of Defence. The system was originally developed by the US government for military navigation, but now anyone with a GPS device, can receive the radio signals that the satellites broadcast. Before 1983, accuracy for civilian users was “intentionally” degraded to +/- 100 m, but this was eliminated in May 2000.

The Global Positioning System (GPS) is a network of about 30 satellites orbiting the Earth at an altitude of about 20,000 km in six different orbital paths. There are at least 24 operational GPS satellites at all times plus 6 spare satellites. The satellites, orbit with a period of 12 hours (two orbits per day), traveling at speed of 3.9 km/s or 14,000 kph. Ground stations are used to precisely track each satellite’s orbit.

Each satellite weighs approximately 1000 Kg and is about 5 meters across with the solar panels extended. Each satellite transmits on two frequencies. These are designated as L1 and L2. A Civilian GPS uses the L1 signal frequency (1575.42 MHz) in the UHF band. The signals travel by line of sight, meaning they will pass through clouds, glass, plastic, etc. but will not travel through solid objects such as buildings and mountains.

Each satellite is expected to last approximately 10 years. Replacements are constantly being built and launched into orbit.



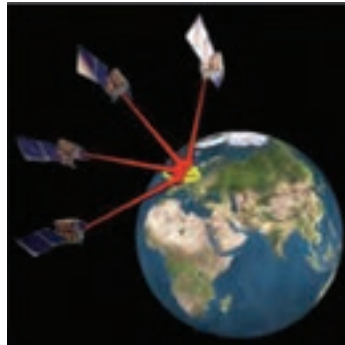
**The Satellite Network**

The GPS satellites transmit signals to GPS receivers. Each one transmits information about its position and the current time at regular intervals. All GPS satellites synchronize operations so that these repeating signals are transmitted at the same instant. These signals, traveling at the speed of light, are intercepted by GPS receivers. The distance to the GPS satellites can be determined by estimating the amount of time it takes for their signals to reach the receiver. When the receiver estimates the distance to at least four GPS satellites, it can calculate its position in three dimensions.

The GPS receivers passively receive satellite signals; they do not transmit and require an unobstructed view of the sky, so they can only be used effectively outdoors. GPS operations depend on a very accurate time reference, which is provided by atomic clocks on board the satellites. These atomic clocks keep accurate time.

The accuracy of a position determined with GPS depends on the type of receiver. Most receivers have an accuracy of about  $\pm 10\text{m}$ . Other types of receivers use a method called Differential GPS (DGPS) to obtain much higher accuracy. DGPS requires an additional receiver fixed at a known location nearby. Observations made by the stationary receiver are used to correct positions recorded by the receivers, producing an accuracy greater than 1 meter.

The GPS system works in all weather conditions and this is one of the biggest benefits of this system. Wherever you are on the planet, at least four GPS satellites are ‘visible’ at any time. It means we can receive satellite signals anywhere in the world, at any time. It is no matter what our application is, when we need it the most, when we’re most likely to get lost, our GPS receiver will keep right on working, showing right where we are.



### Exercise 1

Match the words on the left with definitions on the right.

1. The number of operational GPS satellites	a) 3/9 km/s or 14,000kph
2. The number of GPS satellites	b) 24 satellites
3. GPS satellites signals traveling at the speed	c) 30 satellites
4. The number of spare GPS satellites	d) of light
5. The GPS satellites traveling at speed of	e) 6 satellites

### Exercise 2

Complete the following sentences with the appropriate word or phrase.

Example: The ...GPS satellites... are referred to as NAVSTAR satellites.

1– Each satellite weighs ..... 1000 Kg and is about ..... meters across with the solar panels extended.

2 – The Global Positioning System (GPS) is a network of about 30 satellites ..... the Earth at an altitude of about 20,000 km in six different ..... paths.

3 – Each satellite transmits information about its ..... and the current time at regular .....

4 – Each satellite transmits on two .....

5 – The GPS system works in all ..... conditions.

### Exercise 3

Choose the best answer.

1. When was accuracy degraded to +/- 100 m for civilian users?
  - a) in 1983
  - b) after 1983
  - c) before 1983
2. What does “intentionally” mean in paragraph 1?
  - a) seriously
  - b) deliberately
  - c) basically
3. There are ..... satellites orbiting the earth in the Global Positioning System.
  - a) 30
  - b) 24
  - c) 26
4. The satellites orbit the earth in ..... different orbital paths.
  - a) 4
  - b) 6
  - c) 8
5. There are 24 operational GPS satellites at all times plus 6 ..... satellites.
  - a) main
  - b) reference
  - c) spare

6. Satellites ..... on two frequencies L1 and L2.
  - a) transmit
  - b) move
  - c) orbit
7. Signals are not able to travel through .....
  - a) clouds, glass, and plastic
  - b) solid objects
  - c) liquids
8. How long does each satellite last?
  - a) about 10 years
  - b) about 15 years
  - c) about 20 years
9. What do GPS operations depend on?
  - a) accurate orbit
  - b) accurate position
  - c) accurate time reference
10. What is the most important benefit of GPS?
  - a) It works in all weather conditions.
  - b) It transmits the radio waves to other ships.
  - c) It is able to calculate our positions accurately.

## **STRUCTURES:**

### **Indirect Questions:**

Direct questions are the “normal” questions that we can ask friends, family members, and people that we know well.

Example of a direct question: “Where’s the engine room?”

Indirect questions are a little more formal and polite. We use them when talking to a person we don’t know very well, or in professional situations. Indirect questions are formed in a different way.

Example of an indirect question:

“Could you tell me where the engine room is?”

You may use the following patterns to begin indirect questions:

- Could you tell me...?
- Do you know...?
- I was wondering...
- Do you have any idea...?
- I'd like to know...
- Would it be possible...?
- Is there any chance...?

Like direct questions they demand a response, but they are expressed as declarations without the formal characteristics of a question. That is, they have no inversion, no interrogative words, and no special intonation.

- In indirect questions with is/are, the verb (is) comes after the subject.
- In indirect questions, we don't use the auxiliary verbs do/does/did.
- Again, there is no auxiliary verb did in the indirect question.
- For direct questions with can, we can use the phrase “would it be possible...”

to make it indirect.

• “Is there any chance...” is another option for forming indirect questions with can.

• The auxiliary verbs have and has can be used in both the direct and indirect questions – but in the direct question, “has” comes before the subject, and in the indirect question, “has” comes after the subject.

**For instance:**

- ( Direct Question ) What time is it?  
– (Indirect Question) Do you know what time it is?
- ( Direct Question ) Who is the ship owner?  
– (Indirect Question) I don't know who the ship owner is.

- ( Direct Question ) Where can I find the master?
  - ( Indirect Question ) Can you tell me where I can find the master?
- ( Direct Question ) How has he managed to perform so many duties?
  - ( Indirect Question ) Do you have any idea how he's managed to perform so many duties?

\* Be careful with do/does/did questions (simple present and past). We say:

- ( Direct Question ) What time does the container vessel arrive?
  - ( Indirect Question ) Do you know what time the container vessel arrives?
- ( Direct Question ) How did you survive that heavy hurricane?
  - ( Indirect Question ) I wonder how you survived that heavy hurricane.
- ( Direct Question ) Where do the cadets sleep?
  - ( Indirect Question ) Can you tell me where the cadets sleep?

## Exercise 1

Make indirect questions. (There maybe more than one correct answers.)

- 1) How can I get to the deck?  
.....
- 2) What does a thermometer measure?  
.....
- 3) What does a fire extinguisher do?  
.....
- 4) When was this tanker built?  
.....

## Exercise 2

Correct the following sentences.

- 1) Can you remember when did the vessel leave the port?  
.....

- 2) I wonder why did the deck officer react angrily?  
 .....
- 3) Do you know where is the nearest dock?  
 .....
- 4) Could you tell me what is the chief engineer responsible for?  
 .....

### Exercise 3

Order the words to make indirect questions:

- 1) the / capable / do / what / carpenter / of / know / is / you / doing ?  
 .....
- 2) who / can / ship / the / is / you / charge / tell / of / me / in ?  
 .....
- 3) most / to / could / me / you / carry / tankers / what / tell / designed / are ?  
 .....
- 4) means / know / what / aft / you / do.  
 .....

### NOTE

Use if or whether where there is no other question word (what, why, etc.):

e.g. Did anybody see you?

Do you know if (whether) anybody saw you?

Use the following sentences to make indirect questions:

1. Are there 6 or 26 spare satellites orbiting the Earth?  
 Do you have any idea.....
2. Are the satellites that orbit the Earth very heavy?  
 I wonder .....
3. Did the seamen understand the instructions on using GPS receivers?  
 I don't know .....



4. Have you ever travelled in a passenger ship?  
I'd like to know .....
5. Can I work in a passenger ship to travel if I don't have the money to buy a ticket?  
I am wondering .....
6. Do sailing boats have an engine or are they pushed by the wind.  
Do you know .....
7. Could you help me find our position using the GPS?  
I wonder .....
8. Do receivers work efficiently only outdoors?  
Can you tell me .....

### **Wetlands in Danger**

Wetlands – swamps, marshes, bogs, fens, estuaries and tidal flats– covering about six percent of the surface of the Earth– are among the most common and productive ecosystems of the world. They support biodiversity, by providing habitats for thousands of species of plants and animals, and serve as important regulators of climate and the water cycle. Wetlands also have a remarkable capacity to filter and clean up water pollutants, by the use of the so-called self purification capacity. The many valuable assets of wetlands are not fully understood or appreciated. They are either drowned or drained and used intensively for various human activities. About half of the world's swamps and marshes have been estimated to have been lost.



# SAFETY ONBOARD

Safety onboard ships is an important issue. Normally at sea and often very far from any possible assistance, there is nobody who can be called upon for help. Of course, the ship should be of good design, well maintained and in seaworthy condition with sufficient stability, watertight and weather tight and properly equipped.

Prevention through recognition, rectification and avoidance of unsafe actions and/or situations at all times and at all places on board by all personnel and passenger, is of utmost importance.

Courses and regular drills are held in order to ensure that the crew is safety-conscious. The crew is trained to use the right equipment in case of emergency.

To work professionally with all equipment, the ship's crew needs to be educated and everyone must have certificate of competency. This certificate can only be obtained when the individual is in possession of the proper diplomas, sufficient sea service and a number of certificates obtained after fulfilling certain safety courses.

**Safety clothing:** It is a legal requirement that you wear the proper safety clothing and footwear in those parts of the ship where certain hazards exist. Hard (safety) hats and proper protective (safety) shoes are the minimum for working on external decks. Inflatable (working) lifejackets are supplied in the Laboratory and will also be required to be worn in certain situations when working at or near the ship's side or stern. In addition to working lifejackets, certain operations will require safety harnesses to be worn if the master deems it necessary.

**Manual handling:** The motion of a ship will increase the risk of slips, falls and muscular injuries. Relatively simple tasks may require two people so always ask for assistance if in doubt. Always undertake a risk assessment prior to lifting or moving anything on board the vessel.

**Electrical safety:** Ship's power supplies may look similar to shore systems, but have subtle and potentially dangerous differences. Do not attempt to interfere with any electrical supplies or fittings on board at any time.

### **Lifesaving Appliances:**

**Lifeboats:** Lifeboats have to be installed on each side of the ship. The boat/ boats on each side shall be capable of accommodating everybody on board.



**Life Rafts:** Inflatable life rafts are located on each side for the whole complement.



**Life Jackets:** Life jackets are provided for everybody on board. They must have a light and whistle. They are usually stored in the cabins, but sometimes in boxes near the lifeboats.



**Life Buoys:** A number of Life buoys, depending on the ship's length are positioned around the vessel and hooked on the handrails. On both bridge wings there has to be a life buoy, that when released, drops by gravity into the sea. Attached to these buoys are a floating smoke light and a light signal.



**Immersion Suit:** An immersion suit has to be worn together with a life jacket. The insulating quality of the immersion suits has to be such that the body temperature does not drop more than 2 degrees Celsius after 6 hours in water with a temperature between 0 and 2 degrees Celsius.



## Safety Signs Onboard Ship

Safety signs on board ship alert the crew to hazards, equipment, escape routes, etc. Signs identifying enclosed spaces play a part in reducing accidents in these areas. In the marine industry, signs on ships now serve a vital function but it was not always so.

What have been mentioned above are the main safety measures, but there are a lot more for your safety. However if you have a problem, you should contact an officer who deals with the matter.

Some safety signs onboard ships are as below:

**Hazard**



**Explosive hazard**

**Safety Equipment**



**Stretcher**

**Fire fighting**



**Fire alarm**

**Mandatory**



**Wear ear protection**

**Prohibition**



**No Entry**



**Fire main section valve**



**Life buoy**

## Exercise 1

Match the words on the left with definitions on the right.

1. Lifeboats	a) A number of this appliance, depending on the ship's length are positioned around the vessel and hooked on the handrails.
2. Immersion suit	b) These inflatable appliances are located on each side for the whole complement.
3. Life jackets	c) These indicators on board ship alert the crew to hazards, equipment, escape routes, etc
4. Life buoys	d) These appliances have to be installed on each side of the ship, each capable of accommodating everybody onboard.
5. Safety signs	e) This lifesaving appliance has to be worn together with a life jacket.
6. Life rafts	f) These lifesaving appliances are provided for everybody on board. They must have a light and whistle.

## Exercise 2

Complete the following sentences with the appropriate word or phrase.

Example: ...Lifeboats... have to be installed on each side of the ship, each capable of accommodating everybody on board.

1- ..... on board the ships is an important issue.

2- To work professionally with all ....., the ship's crew needs to be educated and everyone must have certificate of competency.

3- Any seaman should wear the correct ..... clothing and footwear in those parts of the ship where certain hazards exist.

4- The motion of a ship will increase the ..... of slips, falls and muscular injuries.

5- Safety signs on board ship alert the crew to ....., equipment, escape routes, etc.

### Exercise 3

Choose the best answer.

- 1– What does “water-tight” mean?
  - a) Capable of resisting the passage of water.
  - b) Capable of admitting the passage of water.
  - c) Capable of making the ship dry.
- 2– Prevention of danger might be done through ..... unsafe actions and situations.
  - a) confronting
  - b) facing
  - c) keeping away from
- 3– According to the text, courses are held and regular drills are given to make sure the crew .....
  - a) is familiar with ship’s spare parts.
  - b) is familiar with safety rules.
  - c) is familiar with the organization of the ship.
- 4– It is important for the crew to use ..... in case of emergency.
  - a) the proper uniform
  - b) the suitable instruction manuals
  - c) the right equipment
- 5– When an individual gets the proper diploma, enough sea service and certain safety courses; he can obtain .....
  - a) certificate of seamanship knowledge.
  - b) certificate of profession.
  - c) certificate of competency.
- 6– Crew shall wear at least ..... and ..... on external decks.
  - a) hard hats– safety shoes
  - b) proper equipments– foot wear
  - c) life jackets– harness



7- The risk of slips, falls and muscular injuries can be increased by

.....

- a) repairing the engine .
- b) the use of heads .
- c) the motions of the ship .

8- Where are the lifeboats installed?

- a) On the port side of the ship .
- b) On each side of the ship .
- c) On the starboard side of the ship .

9- What does the following sign mean on board ship?



- a) Explosive hazards
- b) Stretcher
- c) Fire main section valve

10- Which one of the signs below means “ life buoy”?



a)



b)



c)

# STRUCTURES:

## PREFIXES AND SUFFIXES

Adding affixes to the existing word (the base or root) to form new words is common in English. Prefixes are added to the front of the base (like → dislike), whereas suffixes are added to the end of the base (active → activate). Prefixes usually do not change the part of speech of the base word, but suffixes usually do change the part of speech of the word.

Prefixes:

prefix + verb → verb

Prefix	Meaning	Examples
re-	again or back	restructure, rewrite, reappear, rebuild, reread
dis-	reverses the meaning of the verb	disappear, disagree, disarm, disconnect, discontinue
un-	reverses the meaning of the verb	unbend, uninstall, unfasten
mis-	badly or wrongly	mislead, misunderstand, misidentify
co-	together	co-exist, co-operate, co-act

Prefixes added to nouns

prefix + noun → noun

Prefix	Meaning	Examples
anti-	against	antibiotic, anticancer, antioxidant
auto-	self	autobiography, autopilot
co-	joint	co-founder, co-owner, co-writer
dis-	opposite	discomfort, dislike
mis-	wrong	misconduct, mislead, mismanagement
re-	again	re-organization, re-assessment, re-examination
ultra-	beyond	Ultrasound, ultraviolet

Negative prefixes added to adjectives:

negative + adjective → adjective

Prefix	Examples
un-	unfortunate, uncomfortable, unjust
im-/in-/ir-/il-	immature, impatient, improbable, inconvenient, irreplaceable, illegal
non-	non-fiction, non-political, non-neutral
dis-	disloyal, dissimilar, dishonest

## Exercise 1

According to the given meaning, use proper prefixes for the following nouns, adjectives, and verbs:

- 1) Possible: ..... (negative meaning)
- 2) Management: .....(negative meaning)
- 3) Appear: .....(negative meaning)
- 4) Biography: .....(self)
- 5) Honest: .....(negative meaning)
- 6) Estimate: .....(opposite meaning)
- 7) Work: .....(too much)
- 8) Reliable: .....(negative meaning)
- 9) Comfort: .....(negative meaning)
- 10) Comfortable: .....(negative meaning)
- 11) Understand: .....(negative meaning)
- 12) Build: .....(again)
- 13) Similar: .....(negative meaning)
- 14) Operation: .....( joint)
- 15) Sound: .....(beyond)
- 16) Climax: .....(against)

## Suffixes:

Suffixes used to form verbs with the meaning “cause to be”.

Suffix	Example
* -ise, ize	stabilise, characterise, symbolise, visualise, specialise
-ate	differentiate, liquidate, pollinate, duplicate, fabricate
-fy	classify, solidify, simplify, justify
-en	awaken, fasten, shorten, moisten

Suffixes added to form nouns:

Suffix	Meaning	Examples
-ity	state or quality of being A	ability, similarity, responsibility, curiosity
-ness	state or quality of being A	darkness, preparedness, consciousness
-cy	state or quality of being A	urgency, efficiency, frequency

Suffixes added to verbs and nouns:

Suffix + verbs or nouns → adjective

Suffix	Example
-al	central, political, national, optional, professional, mechanical
-ent	different, dependent, excellent
-ive	attractive, effective, imaginative, repetitive
-ous	continuous, dangerous, famous
-ful	beautiful, peaceful, careful
-less	endless, homeless, careless, thoughtless
-able	drinkable, countable, avoidable
-ance	guidance, assistance, importance

## Exercise 2

Match the following words with a proper suffix:

- |              |              |
|--------------|--------------|
| a) Beauty    | 1. -able     |
| b) Assist    | 2. -ity      |
| c) Fast      | 3. -ful      |
| d) Simple    | 4. -ance     |
| e) Avoid     | 5. -en       |
| f) Curious   | 6. -fy       |
| g) Effect    | 7. -ous      |
| h) Conscious | 8. -ise/-ize |
| i) Liquid    | 9. -less     |
| j) Thought   | 10. -ive     |
| k) Stable    | 11. -ness    |
| l) Fame      | 12. -ate     |

## Exercise 3

Write the correct form of the words in parentheses in the provided spaces.

- You should walk more ..... while the deck is wet. (careful)
- The first thing he looked at was the ..... (local) of the ship.
- It is .....(legal) not to wear the proper safety clothing and footwear in those parts of the ship where certain hazards exist.
- You need to use the right ..... (equip) in case of emergency.
- Hard hats and ..... (protect) shoes are needed while working on external decks.
- Don't hesitate to ask for ..... (assist) when you don't know how to do something.
- ..... (inflate) working lifejackets are to be worn while working in the Laboratory or near the ship's side and stern.
- The ship should be in seaworthy condition with sufficient ..... (stable).

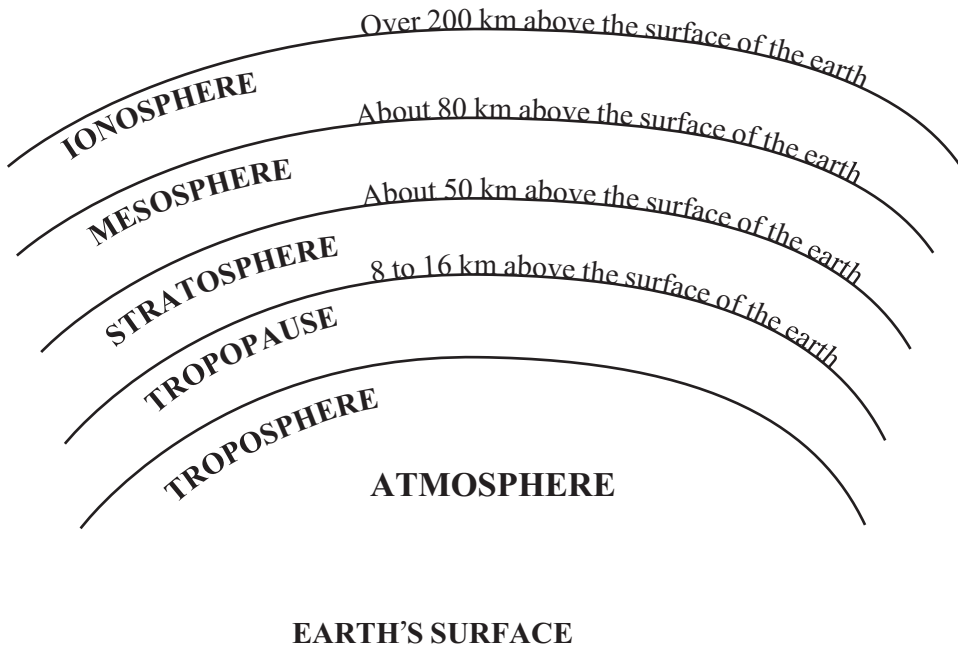
## Sea Pollution

Until recently, pollution of the seas has been regarded as only a local environmental threat. However, pollution distributed around coastlines of most continents is now beginning to threaten also the open seas. It is evident that enclosed and isolated seas are the most vulnerable. The most well-known examples include the Aral Sea, the Mediterranean, the Black Sea and the Baltic. Looking at the sea as a pollutant recipient, it receives polluting inputs from atmospheric fallout, land-based discharges, ship dumping of industrial and municipal waste and sludge and from offshore gas and oil production. All these sources contribute almost all types of known pollutants and an increasing number of reports serve as warnings of the gradual deterioration of the oceans.



# THE ATMOSPHERE

The air around the earth is called the atmosphere and extends to over 200 kilometers above the surface of the earth. The atmosphere consists mainly of Nitrogen (about 78%) and Oxygen (about 21%). Different layers of the atmosphere are called by different names. In ascending order they are troposphere, stratosphere, mesosphere and ionosphere.



Nearly all of the weather changes occur, and nearly all of the water vapor of the atmosphere is contained in the troposphere which extends to a height of about 8 km above the poles and about 16 km above the equator.

The area of separation between troposphere and the stratosphere is called the tropopause.

Stratosphere is the second layer which extends upwards from the tropopause to about 50 km. It contains much of the ozone in the atmosphere. The increase in temperature with height occurs because of absorption of ultraviolet (UV) radiation from the sun by this ozone.

The other layers of the atmosphere are not as important in navigation as these two layers are.

### **Temperature of the Atmosphere:**

\*S. I. units of air temperature are degrees Celsius (or centigrade) and degrees Kelvin. Freezing temperature of water is 0 degrees Celsius or 273 degrees Kelvin. Boiling temperature of water is 100 degrees Celsius or 373 degrees Kelvin. In the troposphere, atmospheric temperature normally falls steadily as height increases. In the stratosphere, the air temperature remains fairly steady around  $-56.5$  degrees Celsius ( $216.5$  degrees Kelvin).

It has been observed that atmospheric temperature reaches its maximum at about 1400 hours local time and reaches its minimum at about half an hour after sunrise. Since this happens once per day, it is called diurnal variation of atmospheric temperature and the difference between the maximum and minimum values is called the diurnal range of atmospheric temperature.

Diurnal range of air temperature over land is large (as much as 20 C) whereas over sea, it is very small (less than 1C) for the following reasons:

### **Over land**

1– Land, being a solid, has a low value of specific heat and so heats up or cools very quickly.

2– Heat received from the sun is retained by the top layer of land (only a few centimeters deep) as land is a poor conductor of heat.

3– Negligible evaporation.

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\*The international system of units



## Over sea

1– Sea, being a liquid, has a higher value of specific heat and so heats up or cools slowly.

2– Heat received from the sun is distributed over a large mass of water by convection currents.

3– Evaporation of water during day causes weather cooling which balances some of the heat received from the sun.

The temperature of the land surface therefore varies greatly between day and night. Consequently the air in contact with it has a large diurnal range. Since the temperature of the sea surface does not vary much between day and night, the air in contact with it has a practically negligible diurnal range.

It is interesting to note that the minimum ground temperature may be only a few degrees below the air temperature, but the maximum ground temperature can be even 40 degrees higher than air temperature.

## Exercise 1

Match the words on the left with definitions on the right.

1. Stratosphere	a) 8 to 16 km above the surface of the earth
2. Troposphere	b) The air around the earth
3. Mesosphere	c) About 80 km above the surface of the earth
4. Ionosphere	d) The area of separation between troposphere and the stratosphere
5. Atmosphere	e) About 50 km above the surface of the earth
6. Diurnal range of atmospheric temperature	f) Over 200 km above the surface of the earth
7. Tropopause	g) The difference between the maximum and minimum of atmospheric temperature

## Exercise 2

Complete the following sentences with the appropriate word or phrase.

Example: Different layers of the ...atmosphere... are called by different names.

1. It has been observed that ..... temperature reaches its maximum at about 1400 hours local time.
2. In the ....., atmospheric temperature normally falls steadily as height increases
3. In the ....., the air temperature remains fairly steady around  $-56.5$  degrees Celsius.
4. Land being a solid, has a low value of .....heat and so heats up or cools very quickly.
5. Heat received from the sun is ..... over a large mass of water by convection currents.

## Exercise 3

Choose the best answer.

1. The atmosphere consists of ..... and .....
  - a) Nitrogen (about 80%) and Oxygen (about 20%)
  - b) Oxygen (about 78%) and Nitrogen (about 21%)
  - c) Nitrogen (about 78%) and Oxygen (about 21%)
2. In which layer, do all of the weather changes occur?
  - a) Tropopause
  - b) Troposphere
  - c) Stratosphere
3. How far does the troposphere extend?
  - a) 8 km above the pole and 16 km above the equator
  - b) 16 km above the pole and 8 km above the equator
  - c) 13 km above the pole and 11 km above the equator

4. What is the area of separation between Troposphere and Stratosphere called?
  - a) Stratopause
  - b) Tropopause
  - c) Mesopause
5. Which layer contains much of the ozone in the atmosphere?
  - a) Ionosphere
  - b) Mesosphere
  - c) Stratosphere
6. How does the atmosphere temperature of Troposphere change as height increases?
  - a) It doesn't change at all.
  - b) It increases as well.
  - c) It falls down.
7. In what layer, does the air temperature remain steady as height increases?
  - a) Mesosphere
  - b) Stratosphere
  - c) Ionosphere
8. What is the difference between the maximum and minimum values called?
  - a) Diurnal range of atmospheric temperature
  - b) Diurnal variation of atmospheric temperature
  - c) Diurnal difference of atmospheric temperature
9. Since land is solid, it has a ..... value of specific heat and gets hot and cold .....

  - a) low– slowly
  - b) high– quickly
  - c) low– quickly

10. The minimum ground temperature can be ..... the air temperature.
  - a) a few degrees higher than
  - b) a few degree lower than
  - c) the same as

## STRUCTURES:

### Future with “will”

We use “will”:

- To talk about the future or to say what we believe will happen(predictions)

e.g.

I'll **be** late for the meeting.

It **will be** rainy today.

I think the ship **will arrive** at 6 p.m.

- To talk about what people decide to do or are willing to do

e.g.

A: I'm really hungry.

B: I'll **make** some sandwiches.

We'll **see** you tomorrow at the meeting.

I'll **show** you different parts of the ship.

- To make promises and offers

e.g.

(promise) Don't worry. I'll **be** careful while working in the engine room.

I'm really sorry. I promise I **won't be** late again.

(offer) A: These ropes are really heavy.

B: I'll **give** you a hand.

A: This exercise is really hard.

B: Ask your brother. He **will help** you with it.

Note.

Contractions: 'll=will; won't= will not

The future of there is/are = there will be

The future of I can= I'll be able to

## Exercise 1

Write sentences and questions with will/won't. Use contractions where you can.

1. Watching a ship/ be difficult tonight (-)
2. Tomorrow/ be foggy (?)
3. You/ can find a good job in Navy (+)
4. I / get a glass of water for you (+)
5. He/ get the job (?)
6. They/ arrive on time (-)

## Exercise 2

Complete the conversations below.

1. A: Remember to turn off the lights when you leave your own cabin.  
B: Don't worry, I ..... (not forget) to turn them off.
2. He needs some help to carry those heavy bags.  
B: I ..... (give) him a hand.
3. A: The floor got very dirty.  
B: Some cleaners ..... (clean) it.
4. A: I left my book at home.  
B: I ..... (lend) you mine.
5. A: It's really dark in here.  
B: I ..... (get) a torch.

## Exercise 3

Put in will or won't.

- a) It ..... rain, so you don't need an umbrella.
- b) The ship ..... leave the port in five minutes.
- c) I don't feel well tonight. I ..... be able to work tomorrow.
- d) I ..... show you how to work with all these controls.
- e) Many sailors ..... attend the meeting.
- f) There ..... be a lot of seamen left on the ship when we get to the port.

## **Tankers and the Environment**

The tanker industry has had some serious and very conspicuous accidents over the past few years, which have dramatically emphasized risks inherent in transporting oil by sea. Even if total cargo losses are relatively small compared to the enormous quantities being moved, and even if there are other activities which are more destructive to the environment, this industry must be prepared to accept its responsibilities for protection of the environment, and to meet higher expectations and more severe environmental protection requirements in the future.

